

**TRANSMITTAL OF APPEAL BRIEF**Docket No.  
BRA-10002/03

In re Application of: Albert Bruynesteyn

Application No.  
10/723,392-Conf. #7947Filing Date  
November 26, 2003Examiner  
S. J. BosGroup Art Unit  
1754

Invention: PROCESS FOR LEACHING ACID-CONSUMING ORES

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Dated: September 27, 2007

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of: Albert Bruynesteyn

Serial No.: 10/723,392

Group No.: 1754

Filed: November 26, 2003

Examiner: S. J. Bos

For: PROCESS FOR LEACHING ACID-CONSUMING ORES

**APPELLANT'S APPEAL BRIEF UNDER 37 CFR §41.37**

Mail Stop Appeal Brief  
Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**I. Real Party in Interest**

The real party in interest in this case is Albert Bruynesteyn, Applicant and Appellant.

**II. Related Appeals and Interferences**

There are no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. Status of Claims**

The present application was filed with 10 claims. Claims 11-14 were added and claims 6 and 8 were canceled by amendment in February 2007. Claims 1-5, 7 and 9-14 are pending, rejected and under appeal. Claims 1 and 14 are the independent claims.

**IV. Status of Amendments Filed Subsequent  
Final Rejection**

An after-final amendment is being filed herewith in which claims 13 and 14 have been amended. These amendments are reflected in the Appendix A, Claims on Appeal section of this Brief.

## V. Summary of Claimed Subject Matter

Independent claim 1 is directed to a method of leaching low sulphur content ores to release metal values. The method comprises the steps of: preconditioning finely ground elemental sulphur particles with bacteria in a biological reactor for a sufficient time that the sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions, and agglomerating the sulphur particles after they have been preconditioned with bacteria throughout a leaching heap with the low sulphur content ores to release metal values. (Specification, page 2, line 18 to page 4, line 10).

Independent claim 14 is directed to a method of leaching low sulphur content ores to release metal values. The method comprises preconditioning finely ground elemental sulphur particles with bacteria, comprising *Thiobacillus thiooxidans*, in a biological reactor for at least 12 hours so that the hydrophobic sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions; agglomerating the preconditioned sulphur particles throughout a leaching heap with the low sulphur content ores to release metal values; and adding the acidic bioleach solution to the leaching heap to partially satisfy the acid demand of the ore. (Specification, page 2, line 18 to page 4, line 10 and page 6, line 4 to page 7, line 8).

## VI. Grounds of Rejection To Be Reviewed On Appeal

- A. The rejection of claims 1-5, 7 and 9-14 under 35 U.S.C. §112, first paragraph.
- B. The rejection of claims 1-5, 7 and 9-14 under 35 U.S.C. §112, second paragraph.
- C. The rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.
- D. The rejection of claim 2 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.
- E. The rejection of claim 3 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

F. The rejection of claim 4 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

G. The rejection of claim 5 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

H. The rejection of claim 7 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

I. The rejection of claim 9 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

J. The rejection of claim 10 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

K. The rejection of claim 11 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

L. The rejection of claims 12 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

M. The rejection of claims 13 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

N. The rejection of claim 14 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,387,239 to Duyvesteyn in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

## VII. Argument

### A. The rejection of claims 1-5, 7 and 9-14 under 35 U.S.C. §112, first paragraph.

As an initial matter, although claims 1-5, 7 and 9-14 stand rejected under 35 U.S.C. §112, first paragraph, the Examiner specifically cites only claims 2 and 12-14. Accordingly, claims 1, 3-5, 7, and 9-11 should not be rejected.

Claim 2 adds to claim 1 that “*Thiobacillus ferrooxidans* is added to the leaching heap when the pH of acidic bioleach solution at the bottom of the heap falls below about 2.4.” For support, the Board’s attention is directed to the subject specification at page 6, lines 12-16, which read as follows:

“I have found that once the sulphur in the agglomerated ore started to produce sulphuric acid, and the pH of the solution emanating from the bottom of the ore pile has decreased to the range of 2.4-1.8, the addition to the ore of an actively growing culture of *Thiobacillus ferrooxidans* greatly enhances subsequent copper extraction. It has been shown that the rate of oxidization of ferrous iron by *Thiobacillus ferrooxidans* decreases rapidly with decreasing pH. However, in the heap or dump, the pH in the ore mass can be controlled to be in the range of 1.8-2.4 so that *Thiobacillus ferrooxidans* can significantly assist in the sulphur oxidation process as well as oxidized secondary copper sulphides such as chalcocite.”

Clearly “below about 2.4” is within the range of 1.8 to 2.4 and therefore does not represent new matter.

Claim 12 adds to claim 1 the limitation that “the sulphur particles are preconditioned with bacteria in a biological reactor for at least 12 hours.” For support, the Board’s attention is again directed to the specification at page 6, lines 4-9, which read as follows:

“In the preconditioning step of my process, the finely rod-milled elemental sulphur, along with water, is subjected to a culture of sulphur oxidizing bacteria, preferably including or limited to a culture of *Thiobacillus thiooxidans*, for 12-48 hours in an agitated reactor. During this preconditioning period, the sulphur particles become fully wetted, allowing the bacteria present to attach themselves to the surface of the sulphur particles.”

Clearly, “at least 12 hours” falls into the range of 12-48 and therefore does not represent new matter

Claim 13 adds to claim 1 that "the acid bioleach solutions produced in the reactor are added to the leaching heap." For support, the Board's attention is directed to the specification at page 3, lines 4-10, which read as follows:

"This preconditioning step causes the highly hydrophobic elemental sulphur to become fully wetted allowing the bacteria present to attach themselves to the surface of the sulphur particles. At the same time a quantity of sulphuric acid, normally 20-40 g/L, is produced in the reaction, which can be used to partially satisfy the acid demand of the ore by adding the acid during agglomeration of the ore as well as by adding some of the acid to the leach solution reservoir."

To a person of skill in the art, this passage provides clear support for the limitation that the acid bioleach solutions produced in the reactor are added to the leaching heap.

Independent claim 14 resides in a method of leaching low sulphur content ores to release metal values. The method includes the steps of preconditioning finely ground elemental sulphur particles with bacteria, comprising *Thiobacillus thiooxidans*, in a biological reactor for at least 12 hours so that the hydrophobic sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions; agglomerating the preconditioned sulphur particles throughout a leaching heap with the low sulphur content ores to release metal values, and adding the acidic bioleach solution to the leaching heap to partially satisfy the acid demand of the ore. Although the Examiner argues that "the limitations" of claim 14 represent new matter, they do not. All of the limitations have been discussed above and may be found at least in the Summary of the Invention.

**B. The rejection of claims 1-5, 7 and 9-14 under 35 U.S.C. §112, second paragraph.**

The Examiner argues that in claim 1, the process of "producing acidic bioleach solutions" cannot be possible since elemental sulphur particles and bacteria are both "solid materials." However, this claim must be read in its entirety in view of the specification and with the knowledge of a person of ordinary skill. *In context*, the claim reads:

"preconditioning finely ground elemental sulphur particles with bacteria, in a biological reactor for a sufficient time that the sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions;"

Referring to the text and using the knowledge available to the skilled artisan, *water is involved in the process*, thereby creating a solution. (See, for example, Specification at page 2, line 19). As per the objection to "acidic bioleach solutions," no further explanation is necessary as this is the solution produced by the process of the claim. As such the claim language stand on its own.

Regarding claims 13 and 14, these have been amended to overcome the objections under 35 U.S.C. §112, second paragraph.

C. The rejection of claim 1 under 35 U.S.C. §103(a)

Claim 1 stands rejected as being obvious under 35 U.S.C. 103(a) over Duyvesteyn ('239) in view of U.S. Statutory Invention Registration No. H2005H to Winby et al.

Duyvesteyn discloses a process for bioleaching metal-containing ore in which sulphur-containing compound is mixed with a sulphur selective microorganism to form a solution that is applied to metal containing ore in a leaching heap, along with water or a nutrient solution. Duyvesteyn discloses that the sulphur containing compound may be mixed with the microorganism "... before, during, or after the microorganism contacts the ore ..." column 2, lines 63-64.

The present invention is directed toward a two-step process wherein the microorganisms are first mixed with a sulphur-containing compound by preconditioning finely ground elemental sulphur particles with bacteria in a biological reactor for a sufficient time that the sulphur becomes wetted and that the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions, before adding the precondition sulphur particles to ore in a leaching heap.

Claim 1 includes the limitation of "agglomerating the sulphur particles after they have been preconditioned with bacteria throughout a leaching heap with the low sulphur content ores to release metal values." The step of preconditioning of the sulphur particles with bacteria before addition to a leaching heap containing the ore is neither disclosed nor suggested in either Duyvesteyn or Winby. Duyvesteyn does not disclose or suggest that the sulphur particles become wetted and the bacteria attach themselves to the sulphur surfaces before addition to the leaching heap.

The specification of the present application distinguishes processes of the type disclosed by Duyvesteyn and Winby and points out the important commercial advantages of the present invention as defined in the claims. As set forth in the specification, the preconditioning process greatly speeds

release of metal values from low sulphur content ores in the leaching heap. The curves of Figs. 2, 3 and 4 essentially compare results of the present process with prior art systems like the cited references and show the extremely important commercial advantages of the present invention.

D. The rejection of claim 2 under 35 U.S.C. §103(a)

Claim 2 adds the limitation to the process of claim 1 of adding *Thiobacillus ferrooxidans* to the leaching heap when the pH of the acidic bioleach solution at the bottom of the heap falls between 2.4. Certainly there is no disclosure or suggestion of that step in the cited references.

E. The rejection of claim 3 under 35 U.S.C. §103(a)

Claim 3 adds the limitation to claim 1 of producing the finely ground sulphur by rod milling. As the Examiner notes, the references do not disclose this limitation.

F. The rejection of claim 4 under 35 U.S.C. §103(a)

Claim 4 adds specific limitations to the definition of finely ground sulphur as produced by rod milling which are not disclosed in any of the cited references.

G. The rejection of claim 5 under 35 U.S.C. §103(a)

Claim 5 adds the limitation to the process of claim 1 of adding a bacteria nutrient to the finely ground sulphur particles during their preconditioning with bacteria. Since the cited references do not disclose any preconditioning process to wet the sulphur particles, allowing the bacteria to attach to the sulphur surfaces before adding the wetted sulphur particles to the leaching heap, claim 5 adds a further limitation which distinguishes the present invention from the cited art.

H. The rejection of claim 7 under 35 U.S.C. §103(a)

Claim 7 adds the limitation of the preconditioning of the finely ground sulphur particles with bacteria being conducted for 12-48 hours, clearly not disclosed or suggested by the cited references.

I. The rejection of claim 9 under 35 U.S.C. §103(a)



Claim 9 adds the limitation that acid bioleach solution produced during the preconditioning is added to a leach solution reservoir associated with the leaching heap to partially satisfy the acidic demand of the ore. Neither of the references disclose preconditioning sulphur particles with bacteria to produce an acid bioleach solution and accordingly this limitation clearly distinguishes the claimed invention from the cited references and emphasizes the extremely important commercial advantage of the method of the present invention.

J. The rejection of claim 10 under 35 U.S.C. §103(a)

Claim 10 further limits the method of claim 2 to the step of controlling the pH in the leaching heap in the range of 1.8 to 2.4 to speed the oxidization of metallic sulfites present in the ore, which is not disclosed in the cited references.

K. The rejection of claim 11 under 35 U.S.C. §103(a)

Claim 11 adds to claim 1 the limitation that the bacteria comprises *Thiobacillus thiooxidans*. As such a limitation is neither taught nor suggested by the cited art, alone or in combination, *prima facie* obviousness has not been established.

L. The rejection of claim 12 under 35 U.S.C. §103(a)

Claim 12 adds to claim 1 the limitation that the sulphur particles are preconditioned with bacteria in a biological reactor for at least 12 hours. As such a limitation is neither taught nor suggested by the cited art, alone or in combination, *prima facie* obviousness has not been established.

M. The rejection of claim 13 under 35 U.S.C. §103(a)

Claim 13 adds to claim 1 the limitation that the acidic bioleach solutions produced in the reactor are added to the leaching heap. As such a limitation is neither taught nor suggested by the cited art, alone or in combination, *prima facie* obviousness has not been established.

N. The rejection of claim 14 under 35 U.S.C. §103(a)

Newly added independent claim 14 emphasizes the two step nature of the present process wherein the elemental sulphur particles are preconditioned in a biological reactor for at least 12 hours to produce acidic bioleach solutions before agglomerating the preconditioned sulphur particles in the leaching heap and adding the acidic bioleach solution to the leaching heap to partially satisfy the acid demand of the ore. None of these limitations are disclosed in the cited references.

### Conclusion

In conclusion, for the arguments of record and the reasons set forth above, Appellant seeks the Board's concurrence that all pending claims are in condition for allowance.

Respectfully submitted,

Date: Sept. 27, 2007

By: \_\_\_\_\_

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**APPENDIX A**

**CLAIMS ON APPEAL**

1. A method of leaching low sulphur content ores to release metal values, comprising:  
preconditioning finely ground elemental sulphur particles with bacteria, in a biological reactor for a sufficient time that the sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions; and  
agglomerating the sulphur particles after they have been preconditioned with bacteria throughout a leaching heap with the low sulphur content ores to release metal values.
2. The method of claim 1 wherein *Thiobacillus ferrooxidans* is added to the leaching heap when the pH of acidic bioleach solution at the bottom of the heap falls below about 2.4.
3. The method of claim 1 wherein said finely ground sulphur is produced by rod milling sulphur.
4. The method of claim 3 wherein the sulphur is rod milled such that 1.9 kilograms of sulphur rod milled in 1 liter of water for 15 minutes produces a product of approximately 50% of 400 mesh fineness.
5. The method of claim 1 further including adding a bacteria nutrient to the finely ground sulphur particles during their preconditioning with bacteria.
7. The method of claim 1 wherein the preconditioning of the finely ground sulphur particles with bacteria is conducted for 12-48 hours.

9. The method of claim 1 further including adding acid bioleach solution produced during preconditioning to a leach solution reservoir associated with the leach heap to partially satisfy the acidic demand of the ore.

10. The method of claim 2 including controlling the pH in the heap in the range of 1.8-2.4 so that the *Thiobacillus ferrooxidans* can rapidly oxidize any metal sulphides present in the ore.

11. The method of claim 1 wherein the bacteria comprises *Thiobacillus thiooxidans*.

12. The method of claim 1 in which the sulphur particles are preconditioned with bacteria in a biological reactor for at least 12 hours.

13. The method of Claim 1 in which the acidic bioleach solutions produced in the reactor are added to the leaching heap.

14. A method of leaching low sulphur content ores to release metal values, comprising:  
preconditioning finely ground elemental sulphur particles with bacteria, comprising *Thiobacillus thiooxidans*, in a biological reactor for at least 12 hours so that the sulphur becomes wetted and the bacteria attach themselves to the sulphur surfaces, producing acidic bioleach solutions; agglomerating the preconditioned sulphur particles throughout a leaching heap with the low sulphur content ores to release metal values; and

adding the acidic bioleach solution to the leaching heap to partially satisfy the acid demand of the ore.

**APPENDIX B**

**EVIDENCE**

None.

**APPENDIX C**

**RELATED PROCEEDINGS**

None.